

CLIMATE CHANGE AND THE KYOTO PROTOCOL

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The problem of global warming is addressed. Changes in earth surface temperature, emission of CO₂ and other four major green house gases are presented. Effect of global warming on weather, ocean, and ecosystem is discussed. A brief history of the Kyoto protocol starting from the 1st Earth Summit in 1972 is outlined. An overview of the protocol and a brief summary are given.

INTRODUCTION

Climate change is evident to all of us. It is a global problem affecting all countries. We notice the growing increase of earth's surface temperature, the growing level of sea water, the increased intensity and frequency of hurricanes and typhoons, and the increasing evidence on ozone layer depletion. There is a growing consensus among scientists that this change is attributable to human activities. According to the 2nd report of the International Panel on Climate Change (IPCC) issued in 1995 "the balance of evidence" pointed to a "discernable human influence on the global climate system", and that the accumulations of greenhouse gases are behind the marked global warming trend of the past 20 years.

The Greenhouse Effect

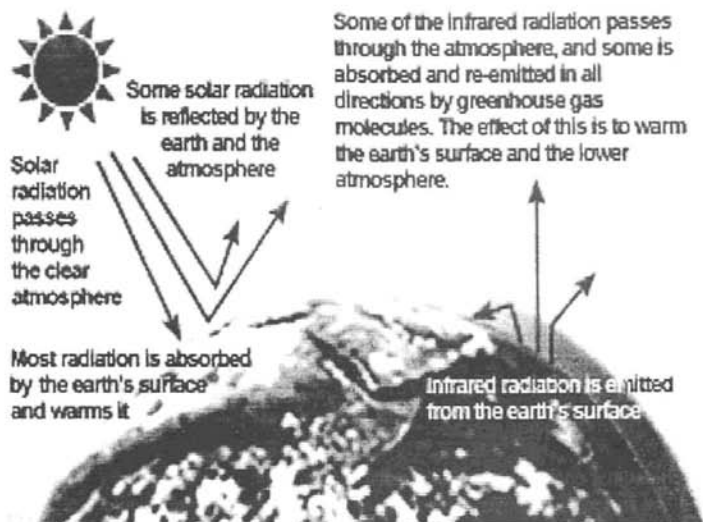


Figure 1. The green-house effect.

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Earth Temperature Change

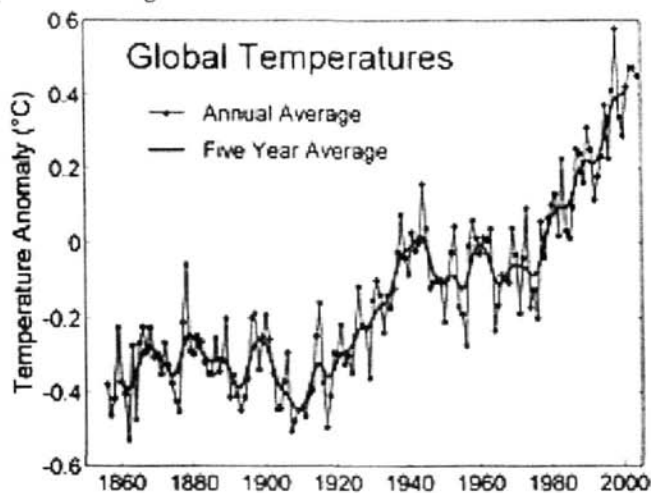


Figure 2. Earth Surface temperature 1860-2000.

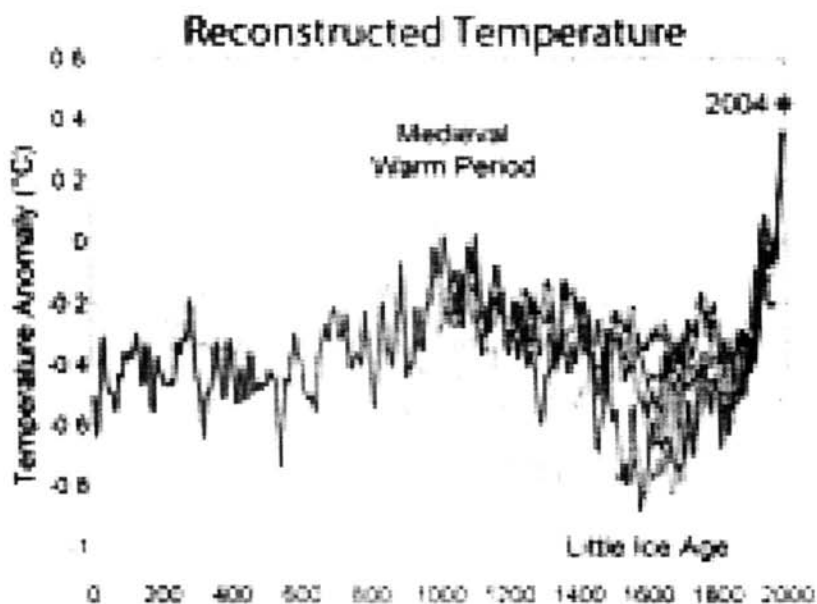


Figure 3. Warming of the earth during the AD period (0-2000).

While greenhouse gases (GHGs) form naturally, many human activities add additional GHGs to the atmosphere. Heating and cooling buildings, using energy at home and work, driving vehicles to move people and goods, powering industrial processes - most things we do that consume energy contribute to the problem. Radiation from the sun enters the earth's

atmosphere, and GHGs act like a greenhouse's glass to block this heat from escaping back to space. There is a direct link between rising atmospheric GHG concentrations, particularly carbon dioxide (CO₂), global warming and more frequent extreme weather events. In Egypt, climate change will affect farming, fishing, lakes, and coastal communities

Major Greenhouse Gases

Production Ways:		Gas	Global Warming Potential
- CO₂ -- burning of organic material - CH₄ -- fuel production and transport; decomposition of organic waste - N₂O -- agricultural and industrial activities - HFCs, PFCs and SF₆ -- variety of industrial processes. They are very powerful greenhouse gases due to their long stay in atmosphere. - A major group of industrial gases, chlorofluorocarbons, or CFCs, are dealt with under the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer		Carbon Dioxide	CO ₂ 1
		Methane	CH ₄ 21
		Nitrous Oxide	N ₂ O 270
		Hydrofluoro Carbons	HFCs 1350
		Perfluoro Carbons	PFCs 6500
		Sulfur Hexafluoride	SF ₆ 23900

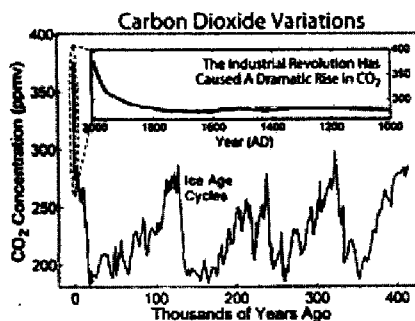


Figure 4. CO₂ Variations over the past 400k years.

Emission rates for the most important anthropogenic greenhouse gas, CO₂, have risen 120-fold in the past 150 years¹. Whereas in the 19th century emissions were overwhelmingly from deforestation and other landuse changes, they are now predominantly from burning fossil fuels. A direct product of industrialization, emissions now amount to 6 billion tons of carbon a year, or around 1 ton of carbon per head of the world's population. But emissions are very uneven. Per-capita North American emissions are 18 times those of Africa, nine times those of Asia and 2.3 times those of Europe¹. Low gasoline prices and the pervasive automobile culture in the United States ensure that its CO₂ output, already the highest in the world, is continuing to rise, while levels in much of Europe are stable or falling.

Unless the world curbs growing CO₂ output, concentrations in the air are likely to double from pre-industrial levels by 2080, and may warm the world by 3oC. Climate models predict

that land areas will warm twice as much as the oceans; high latitudes will warm more quickly in winter; and there will be substantial changes in precipitation, especially in the tropics⁵.

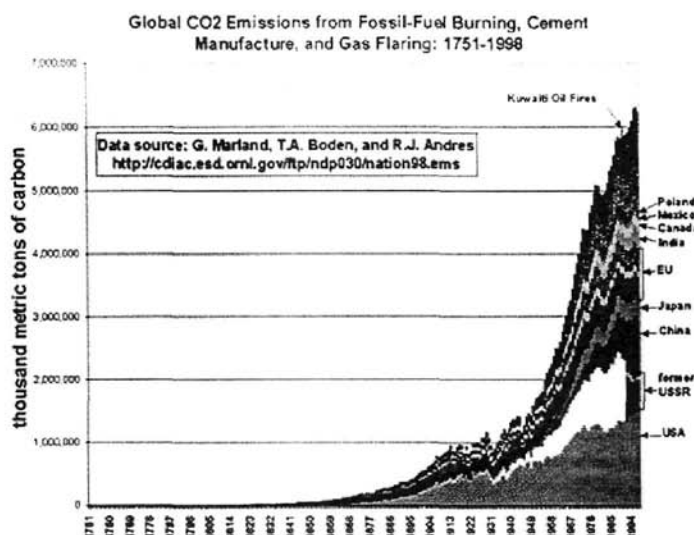


Figure 5. Global CO₂ emission over the period 1751-1998.

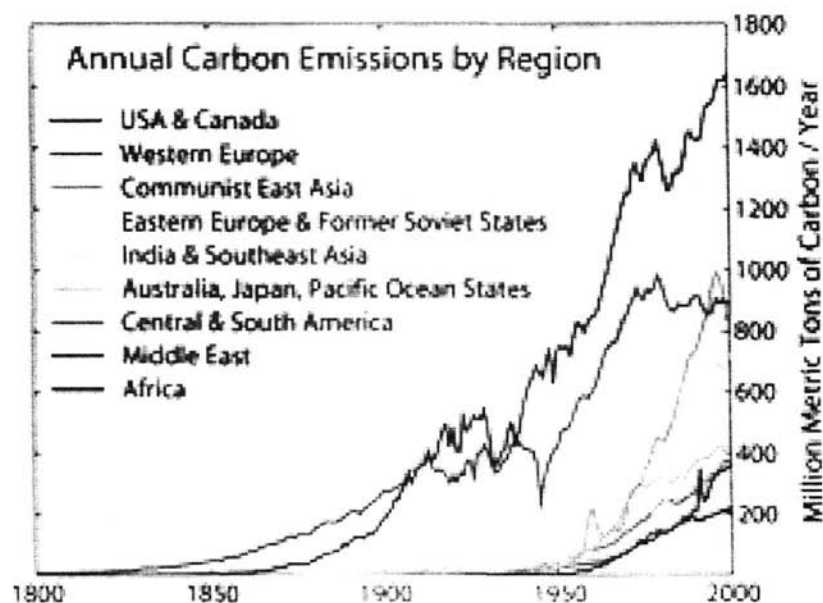


Figure 6. Annual CO₂ emission by region 1800-2000.

Global Trends in Major Greenhouse Gases to 1/2003

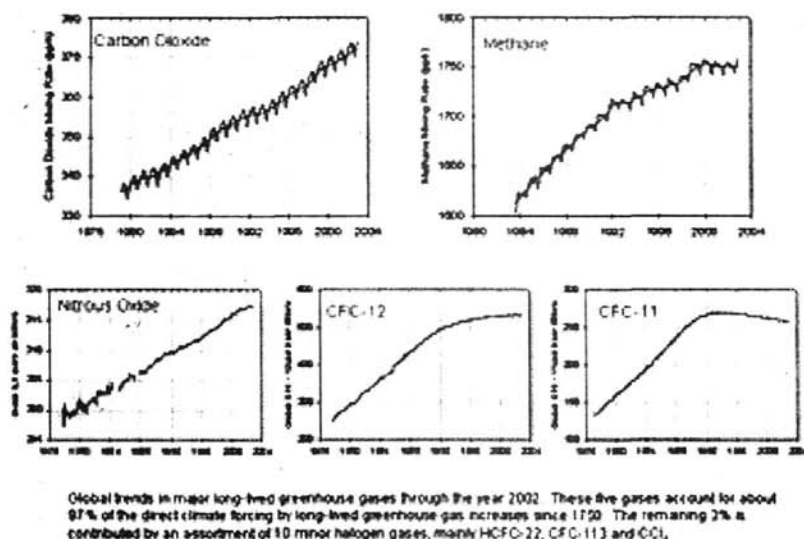


Figure 7. Trends in GHG emissions 1980-2004.

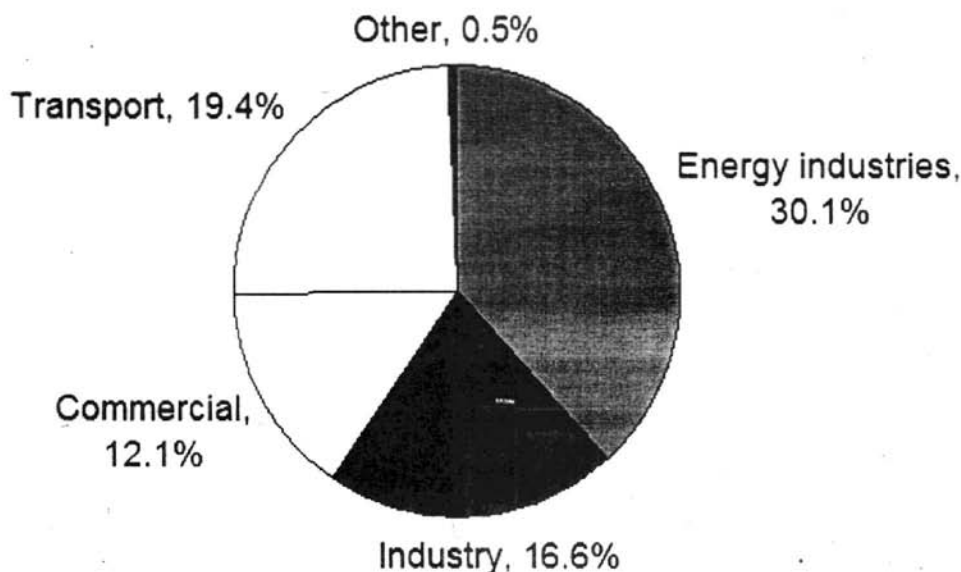


Figure 8. GHG emissions by sector as of 1990.

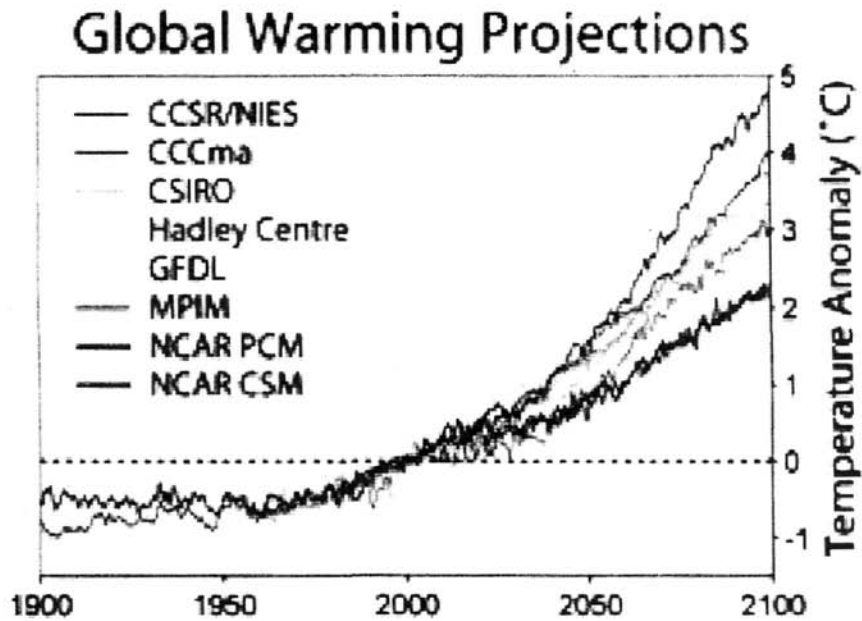


Figure 9. Global warming predictions according to different models.

EFFECTS OF GLOBAL WARMING

Effect on Weather:

- Destabilization of local climate – increased variation in river flows, disappearance of lakes and small in-land seas.
- More extreme weather - evidence on increase in storm strength, hurricanes, tsunamis.
- Cost of catastrophic weather event increased from 2 k\$ in 1950 to 40 k\$ in 2000

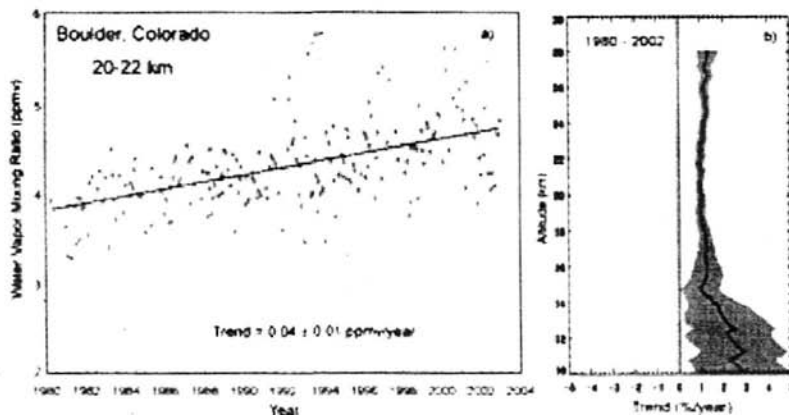


Figure 10. Trend in water vaporization from Boulder lake, California, USA 1980-2002.

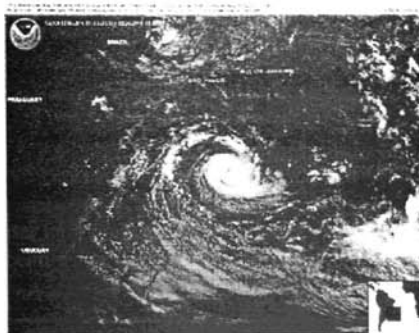


Figure 11. Severe weather conditions, Brazil.

Effect on Oceans:

- Retreat of the glaciers and polar ice caps by 45% from 1880 and observed sea level rise
- Increase of sea water temperature
- Acidification of ocean water due to absorption of increased CO₂.

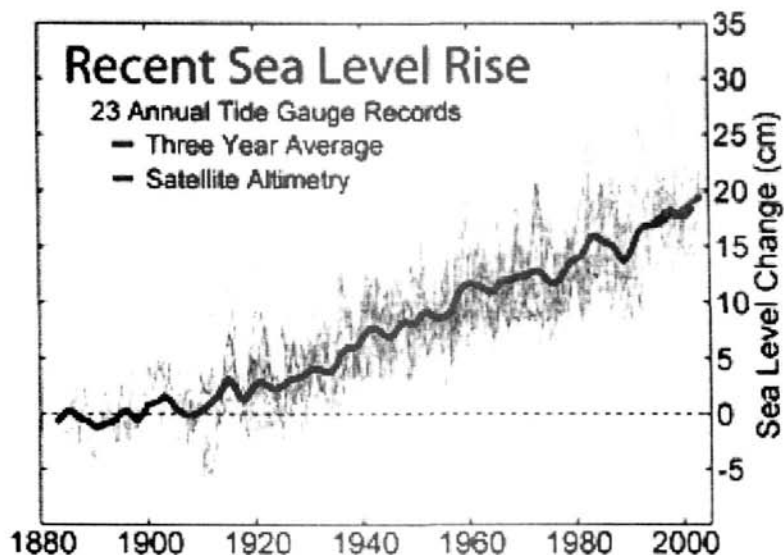


Figure 12. Sea level rise 1880-2000.

Effect on Ecosystem:

Rising temperatures are beginning to impact on ecosystems. Butterflies have shifted their ranges northward by 200 km in Europe and North America. Plants lag behind, and larger animals' migration is slowed down by cities and highways.

Effect on Forest:

Forests potentially face an increased risk of forest fires. The 10-year average of boreal forest burned in North America, after several decades of around 10,000 km², has increased steadily since 1970 to more than 28,000 km² annually.

Consequences of Climate Change

These (among others) include:

- Desertification
- Decline of agriculture
- Water scarcity
- Flood mitigation
- Population migration
- Spread of diseases
- Direct effects on health

Impact of Climate Change on Egypt

- Given Egypt's growing population (84.4M in 2015 and 113.8M in 2050), its limited fertile land, its large area of desert, and presence of sizeable economic activities in the coastal zones, the potential social and economic impact of climate change could be devastating for the country's future."
- According to M. El-Raey estimates (1995) a 0.5 m sea level rise would cause migration of more than 2.0 million people, loss of more than 214,000 jobs and a value loss of more than \$40.0 billion, mainly in Alexandria Governorate and other coastal regions".
- An independent assessment of Integrated Climate Change Impacts on Egypt" (1995) provided the following data:
 - Temp. increase: +4°C for Cairo, + 3.1°-4.7°C for rest
 - Water/cap.: 1990: 1005 m³ , 2060: 452 m³ (World Bank)
 - Agriculture: decline of self-sufficiency: 60% to 10%.

Global Impacts of Climate Change

1. Climate change impacts may challenge the survival of human beings and are a challenge to human security.
2. Climate change impacts will contribute to environmental stress and become a potential cause of conflict constellations.
3. Climate change impacts force human beings to leave their rural home for the next major city (urbanization) or to take refuge in a neighbouring country or overseas (migration).
4. Climate change impacts pose severe challenges for countries with most severe effects of sea level rise in delta areas but also by complex interactions of increasing temperature and declining precipitation in arid- and semi-arid regions.
5. Climate change impacts may contribute to escalation of social, ethnic or religious tension that may erupt in violent riots or result in domestic civil strife or civil war
6. Climate change impacts and disputes on scarce resources – access to water or country-crossing aquifers – may contribute to bilateral or regional non-violent or violent conflicts.
7. Climate change impacts and international environmental refugees may lead to international tensions on migration, on admission of refugees in neighbouring or in industrialized countries and on treatment of immigrant communities.

8. The mitigation of challenges posed by the impact of climate change requires bilateral or multilateral international cooperation, support for adaptive capabilities and a massive technology transfer.

History of the Kyoto Protocol

- **1972 - 1st Earth Summit in Stockholm, Sweden**
Here, the world leaders announced their intention to hold a gathering every ten years to determine the health of the planet.
- **1982 - Earth Summit in Nairobi, Kenya (Failed)**
At the height of the Cold War, this summit failed to reach any significant agreements. It is not considered an official Earth Summit.
- **1988 - The International Panel on Climate Change (IPCC).**
Created by the United Nations, the IPCC brought together scientists from the world's governments. During the 1980s, discussion about climate change focused on whether the world was warming or cooling and the formation of the IPCC marked an important step towards finding scientific answers.
- **1988 - Toronto Conference on the Changing Atmosphere**
One of the world's first major scientific conferences on climate change. It called for a 20% cut to 1988 greenhouse gas emissions by 2005 and called the effect of climate change, "second only to global nuclear war".
- **1990 - The first report of the International Panel on Climate Change (IPCC)**
Released 2 years after its formation. According to IPCC, it had reason to believe that:
1- the planet was warming
2- human activity was causing it.
The Panel also said: given existing models and science, IPCC would need more time to be certain
- **1992 - 2nd Earth Summit, Rio de Janeiro, Brazil**
The largest gathering of world leaders ever, the Earth Summit created the United Nations Framework Convention on Climate Change (UNFCCC), also known as the Rio Convention. This convention adopted on *May 9, 1992* called on the world to stabilize 1990 greenhouse gas emissions by 2000.
- **1995 - Conference of Parties I in Berlin, Germany**
Each year, the countries that ratified the Rio Convention held a *Conference of Parties* (COP). The first of these happened in 1995 and reviewed the adequacy of the Rio Convention's goal of stabilizing greenhouse gas emissions.
- **1995 - The second report of the IPCC**
Five years after saying it needed more science to be certain, the IPCC released its second report saying "the balance of evidence" pointed to a "discernable human influence on the global climate system".
- **1996 - Conference of Parties II (COP II) in Geneva, Switzerland**
In the first meeting after the IPCC's second report, the countries belonging to the Rio Convention said, "climate change represented a danger to humanity".

- **1997 - Conference of Parties III in Kyoto, Japan**
After reviewing the original targets of the Rio Convention and finding them to be too weak, the countries came up with new targets. Now, 1990 greenhouse gas emissions would be cut by 5% between 2008 and 2012.
- Though 5% is a global target, different countries have different targets. The European Union's target is a 8% cut (Germany committed to a 25% cut and the U.K. to 15%). The United States had a target of 7%, while Canada has a target of 6%.
- The Kyoto Protocol is an amendment to the UNFCCC. It was adopted on *December 11, 1997*, opened to signature for one year on *March 16, 1998*. 84 countries signed the protocol during that period including the United States.
- **1998 - Conference of the Parties IV, Buenos Aires, Argentina**
Here, the Buenos Aires Plan of Action was developed to decide how the Kyoto mechanism (emissions trading, carbon sinks, clean development in the developing world, etc.) would be implemented. The countries agreed the mechanism through which targets would be achieved would be finalized by COP VI, or by 2000.
- **1999 - COP V in Bonn, Germany**
Lengthy, arduous, and complex negotiations on the mechanisms
- **2000 - COP VI in The Hague, Netherlands**
Was the deadline the countries gave themselves in Buenos Aires to develop a way to cut emissions as outlined in the Kyoto Protocol.
The meeting failed, largely because of disagreement between the European Union and the US relating to the role of the so called 'flexibility mechanisms'. A subsequent meeting held in Ottawa also failed due to deep policy gap.
- **2001 March Withdrawal of the United States from the Protocol.**
- **2001-2002 - COP VI Part 2 in Bonn, COP VII in Marrakesh** Broad agreement was reached on outstanding issues between the remaining Parties at COP7 enabling the Protocol to move towards possible ratification. 180 countries (that is, the whole world except for the United States and Australia) agreed to the rules for implementing the Kyoto Protocol.
- **2002 - December: Canada ratifies the Kyoto Protocol**
Canada ratified the Kyoto protocol, committing to reduce its greenhouse gas emissions to 6 percent below 1990 levels by 2008-2012.
- **2004 - November: Russia Ratifies the Kyoto Protocol**
For the protocol to go into effect, it must be ratified by the countries who together are responsible for at least 55% of 1990 global greenhouse gas emissions. This milestone was reached once Russia ratified the agreement on November 18.
- **2005 - February: the Kyoto Protocol goes into effect** The Kyoto Protocol automatically goes into effect 90 days after enough countries have signed, making *February 16, 2005* the first day the agreement comes into effect.

Countries Parties to Kyoto Protocol



160 countries (as of 31 Jan. 2006)
Egypt (135) signed 15/3/99, ratified 12/1/05

Fig. 13 Kyoto parties. 160 countries as of Jan. 2006.

Briefing the Kyoto Protocol

1

The United Nations Framework Convention on Climate Change

- The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases.

Under the Convention governments:

- Gather and share information on greenhouse gas emissions, national policies and best practices
- Launch national strategies for addressing greenhouse emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries
- Cooperate in preparing for adaptation to the impacts of climate change

Country Commitments (Annex I Parties)

The following table gives country commitments on GHG emission reduction according to the Protocol.

Table Country commitments

Country	Target (1990 - 2008/2012)
EU-15, Bulgaria, Czech Republic, Estonia, Latvia, Liechtenstein, Lithuania, Monaco, Romania, Slovakia, Slovenia, Switzerland	-8%

US***	-7%
Canada, Hungary, Japan, Poland	-6%
Croatia	-5%
New Zealand, Russian Federation, Ukraine	0
Norway	+1%
Australia	+8%
Iceland	+10%

Kyoto Flexibility Mechanisms

- Three innovative “mechanisms” under the Protocol that are designed to help Annex I Parties reduce the costs of meeting their emissions targets. They enable Parties to achieve emission reductions or to remove carbon from the atmosphere more cheaply in other countries than at home. These are:
 - - **Emissions Trading:** In which nations that emit less than their quota of greenhouse gases will be able to sell emissions credits to polluting nations.
 - - **Joint Implementation Projects:** Allowing Annex I country to invest in emission reduction projects (or enhance emissions-absorbing sinks) in another Annex I party as an alternative to emission reductions in their own countries.
- - **Clean Development Mechanism:** Under which Annex I countries can take credits for projects that reduce emissions in non-Annex I countries. It aims to assist developing countries in achieving sustainable development by promoting environmentally-friendly investment in their economies from industrialized country governments and businesses.
- **In addition**, any group of Annex I countries may create a bubble or umbrella to meet the total commitment of all the member nations. In a bubble, countries would agree to meet their total commitment jointly by allocating a share to each member. In an umbrella arrangement, the total reduction of all member nations would be met collectively through the trading of emissions rights.